there was evidence of very slight hypertrophy, which might easily have escaped any but an expert in physical diagnosis. In all, then, one-quarter of the cases would have been recognized with difficulty or not at all without the sphygmomanometer, except on critical examination by a skilled observer. Such a statement will cause no surprise to those whose diagnostic acumen has frequently been brought before the impartial judgment of the postmortem-room. To all such, who have learned at first hand the almost insoluble nature of many of the clinical problems presented to us, and who feel, as I do, the poverty of our diagnostic resources, the accurate measurement of blood pressure must prove a valuable addition to our methods of physical examination. To those, however, who have not acquired the habits of painstaking observation and careful weighing of evidence, the little knowledge which the instrument can yield may, like other detached bits of information in these days of laboratory diagnosis, prove a really dangerous thing.

A PRELIMINARY STUDY OF VISCERAL ARTERIOSCLEROSIS.[1]

By Harlow Brooks, M.D.,

VISITING PHYSICIAN TO THE CITY HOSPITAL; PATHOLOGIST TO ST. VINCENT'S AND MONTEFIORE HOSPITALS; ASSISTANT PROFESSOR OF PATHOLOGY IN THE UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE, NEW YORK.

I HAD at first intended to present before the Academy a somewhat detailed, though still incomplete, clinical, anatomical, and experimental study of arteriosclerosis of the pancreas. When I was collecting the material from my records I found so much of interest that it seemed necessary, before I should go farther in the investigation of arteriosclerotic disease of any one particular organ, for me to secure, from the study of a large amount of material, a better general understanding of visceral arteriosclerosis; its relative occurrence, etiological factors, and the many other details with which one is confronted in arterial disease, no matter how narrow his chosen field of study.

I have noted with great interest that certain cases of arterial disease show the alterations chiefly confined to the larger trunks, notably to the aorta, carotids, and femorals, while all the peripheral and visceral arteries remain practically free from disease. On the other hand, in a certain considerable number of cases the smaller or medium sized trunks are chiefly involved. In a general and to a fairly certain degree we may state that this second form of the disease is, if we be permitted to exclude the direct and secondary effects of aorteritis and aneurysm formation, of by far the greatest clinical importance.

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[1] Read before the New York Academy of Medicine, February 15, 1906.

A third class of cases is also quite definitely defined anatomically, namely, those in which the changes are microscopic only in character and involve the smaller visceral branches.

Though I realize that these observations are as old as the study of arterial disease itself yet, in going over my cases, I have attempted to classify. these forms of arterioscleross in an endeavor to find if they bear any definite relationship to clinical manifestations or to any reasonably certain etiological data, particularly in regard to the vessels of the viscera. In this connection it must of course be admitted that all these forms of arterial disease blend into one another, particularly when of long standing.

It is with the hope that these general and largely statistical studies, dry and inconclusive as they are, may interest you, and particularly that I may stimulate some of you, gifted with greater powers of clinical acumen, to take up and study this immensely important type of arterial disease from the standpoint of diagnosis and treatment.

I have made no attempt in this general study to classify or to distinguish types or forms of arterial disease. As you are all aware, no satisfactory classification fulfilling all anatomical and clinical requisites has as yet been proposed. I have chosen to give a very literal and broad translation to the term arteriosclerosis, and call it simply "hardening of the arteries." The lumen in some cases is greatly diminished, in others dilated; in some the walls have been the seat of calcareous infiltration, in others the changes have been chiefly those of a fatty degeneration or a fibrous hyperplasia. I have included in my study all such arterial changes as have, through disease of the arterial walls, caused a lack of orientation—that is a lack of proper functional relationship between the arteries and dependent tissues.

The series which I present comprises 400 consecutive cases of arterial disease as they have appeared in my personal necropsical service. Since the majority of these have been submitted simply to gross examination, I have excluded from my statistical analysis all those in which microscopic alterations alone were manifest. It must, therefore, appear that a considerable number of cases in the earlier stages of development must have escaped observation. I have only utilized those in which the arterial changes were of a sufficiently pronounced character to obviously influence the clinical as well as the anatomical manifestations.

All of us who study disease, by following cases through the clinic to necropsy and laboratory, have been impressed with the inefficiency of our present methods of diagnosis of arterial disease. This is especially the case where the lesions are largely or entirely limited to the internal viscera. It is in the hope of contributing in some small way to this particular aspect of the question that this series of studies has been inaugurated. The difficulty of recognition is well illustrated by the fact that of my 400 cases, but 154 were capable of diagnosis by the present methods, which depend almost exclusively on the condition of the superficial trunks. On the other hand, there is a limited number of cases in which peripheral changes may lead to erroneous conclusions; thus, 8 out of my 400 cases presented quite marked and easily detected alterations in the superficial vessels, without disease either of the aorta, large trunks, or those of the important internal viscera.

Of the 400 cases, 368 show serious disease of the visceral trunks. In all but 67 of these the visceral changes are associated with more or less disease of the aorta, though quite frequently, as is well exemplified in renal arteriosclerosis, the aortic alterations were apparently secondary and relatively of much less degree.

OCCUPATION. In regard to occupation nothing of direct general bearing is apparent, except in such instances as lead workers, or in the more severe forms of manual labor, where the relationship is obvious. The occupation was determined in 311 cases, and fairly well represents the relative proportions existing in well-organized urban society. There were 118 laborers, including firemen, blacksmiths, and others whose occupation demands the expenditure of considerable physical effort. Seventy-nine examples of housework, under which head I have also included such occupations as cook, baker, and the like. Forty-five in trades, which series embraced carpenters, jewellers, tailors, and similar workers. A special list of lead workers and painters, five in number, has been made; similarly, a classification of tobacco workers (3), on account of the well-known effect of nicotine in raising the blood pressure, and thus tending toward the causation of arterial disease; six factory workers appear also in a separate class. Five hospital employés, nurses, and orderlies are found, five soldiers or sailors, seven pedlers, seventeen business men, one thief, eight prostitutes, three artists, and four members of the learned professions. Analyses of these occupations in relationship to the various visceral arteries chiefly involved has led to no definite conclusions, though the commonly accepted ideas as regards arterial disease and occupation are substantiated.

ETIOLOGY. Of the 367 cases in which disease of the various visceral arteries was found, alcohol could be classed as a possible etiological factor in 149. That these changes are due principally or exclusively to alcohol alone is not to be assumed, but it appears certain that they are consequent upon the various associated factors of exposure, dissipation, faulty alimentation, and muscular exertion that go with alcohol itself to make up the disease or conditon of alcoholism. Nephritis appears to have been the chief cause in 51 cases, syphilis and old age in 38, respectively. It must be remembered that these four most common etiological factors were often found associated in the same case. Tuberculous disease was found in 31 cases. Ten presented special diseases: three Hodgkin's, three Basedow's, and four acromegalia. The occupation, except for that involving physical hard work, as exemplified in labor, appears to have played a direct etiological role in but 6 instances. No cause could be discovered in either personal or family history in 59 cases.

SEX. Of the 400 included in the analysis, 125 were women and 275 men. Of the 125 female cases of arteriosclerosis 115, or all except 10, showed pronounced involvement of the visceral trunks. Of the 275 men, 253 showed this condition, apparently demonstrating that the relative involvement of the visceral trunks is about equal in the sexes.

AGE. The oldest case in which visceral changes predominated over the lesions of the larger trunks was eighty years; the youngest age, in a pronounced case of Hodgkin's disease, was thirteen years. The average age for the visceral disease was nearly forty-five years.

VESSELS INVOLVED. In all except 30 af the 368 cases more than a single visceral distribution was found to be invaded. Disease of the coronary arteries predominates considerably in number. Coronary sclerosis was found in 270 of the 368 cases, though often in relatively lesser degree than certain other distributions. This proportionately greater involvement of the coronary is probably due to the secondary effects of increased demand for work on the part of the heart, when disease—either dilatation or constriction—of the other usual distributions exist, following probably the physiological relationship between splanchnic hyperæmia and heart action.

Alcohol is by far the most frequent etiological factor concerned in the production of coronary disease. It seems to have been the sole or chief agent in 107 cases. Nephritis appears as the second most frequent cause of disease of the coronaries. This predominated in 35 cases, in 6 of which, however, it was associated with alcohol. Syphilis was found connected with coronary disease in but 27 instances, and in 10 of these alcohol also appeared. Aside from these three etiological factors tuberculosis is found in 19 cases, senility in 15, and excessive use of tobacco in 9. In explanation, it should perhaps be stated that in old age universal involvement of the visceral arteries was the rule.

Next in frequency are the arteries of the brain, 132 cases. Here again alcohol appears as the most prominent agent, acting in 48 cases, syphilis in 21, nephritis in 19, old age and tuberculosis in 10 each. Excessive use of tobacco appears to have been chiefly concerned in 3 cases, lead, occupation, malaria, insolation, and cancer in 2 cases each.

The renal vessels appear third in rate of occurrence. They were found markedly involved in 81 cases, 43 due to excessive use of alcohol, 10 to primary nephritis, the same number to syphilis, 8 to tuberculosis, 4 to old age, and the rest to miscellaneous causes.

Fourth in number are the vessels of the pancreas, which were found involved 74 times. Alcohol again leads with 19 cases, syphilis and senility 9 each, and but 6 are associated with primary nephritis. Tuberculosis and diabetes follow with 4 cases each; 4 also occurred in acromegalia, complicated in three instances by glycosuria.

The hepatic vessels were found diseased in 43 cases, 12 due to alcohol, 8 to nephritis, 6 to syphilis, 3 to senility, and the remainder to various causes.

Sixth appear the splenic arteries with 35 cases, 9 due to alcohol, 7 to syphilis, and 4 to nephritis. Endocarditis, senility, and tuberculosis each caused 2, while the remainder were due to irregular factors.

The vessels of the lungs are seventh. Syphilis and senility lead with 5 cases each, alcohol and tuberculosis 4, and nephritis 2.

The cœliac axis and its visceral branches were diseased to greater degree than the other trunks of corresponding size in 19 cases, 6 of which were associated with alcoholism. Diffuse involvement of the mesenteric vessels was pronounced in 4 cases, all associated with adiposis.

The spinal vessels appeared extensively diseased in 20 cases, 4 alcoholic, 4 syphilitic, and the remainder chiefly in primary spinal diseases.

Cause of Visceral Arteriosclerosis. It may seem somewhat premature at this point to attempt to account for the apparent selective tendency on the part of certain etiological conditions toward the involvement of specific visceral arteries. Nevertheless, I feel that careful study of my series of cases is strongly suggestive of what has also appeared to me as a clinical fact, namely, that the changes are likely to appear first and to be found in greater degree in those arterial distributions which are called upon to functionate most actively under the special stimulus at work. Thus in those conditions where the heart action is considerably augmented, as in alcoholism, severe labor, or nephritis, the increased work of the heart muscle demands a more or less heightened and prolonged physiological hyperæmia of the myocardium. Similarly, in over-alimentation the same condition is demanded in the pancreatic, gastric, and hepatic vessels. As a result of the overwork of the special arteries, perhaps from simple persistent dilatation in many cases, these trunks begin to show alteration of a prematurely senile nature. It is probable that in this way personal habits also influence to a large degree the arteries diseased. This is manifestly difficult to demonstrate from necropsical data collected mostly from hospital cases.

This winter I have apparently been able to produce, in experimental animals, arteriosclerotic changes in various viscera by artificially inducing a prolonged vasodilatation. Further experiments designed to disprove or corroborate these findings are now under way.

In various toxic conditions, as in tuberculosis, syphilis, and practically all the infectious diseases, added to, or perhaps acting quite independently of, the factors just considered, are the local effects of a poison circulating in the blood. This is particularly true of the blood largely supplied to the absorptive and excretory organs where, due to direct action on the intima, through the vasovasorum, or by irritative effects on the subendothelial connective tissue and adventitia, necrotic and hyperplastic vascular changes are to be expected first in these special organs.

PATHOLOGICAL ANATOMY. The pathological changes which follow as a direct result of these arterial lesions differ, as a matter of course, according to the precise change present in the vessels, the etiological factors, and the anatomical and physiological nature of the organ affected. In a general study of this kind it is impossible to describe these in full, or to even more than mention them, and, since the more important of these changes are now being studied in detail, nothing but very general statements will be attempted here.

In general it may be safely stated that the first effect of the arterial disease appears in the parenchymatous tissues supplied by the vessels. The alterations are those with which we meet in most conditions of general or local malnutrition—as in starvation, old age, or local anæmias. These consist, in the greater number of cases, either of an atrophy, usually with hæmochromatosis (brown atrophy) or of changes best classed either under the heading of fatty infiltration or degeneration.

These alterations are naturally followed by functional diminution in the physiological activities of the organ. Parenchymatous or albuminous degeneration is, in my experience, rather unusual except when the arterial disease is accompanied by other factors —as a general infectious process, or in acute arteritis.

Following atrophic alterations in the parenchyma, as a logical result, in strict accordance with the general laws governing atrophy and interstitial growth, connective-tissue hyperplasia follows, originating from the perivascular connective-tissue network or from the normal supporting stroma of the organ. Where the arterial disease is not generalized in the organ, but is limited to one or more trunks in the early stages, changes are obviously most pronounced in the distribution of these vessels and their immediate vicinity. Where, however, the progress is more general, the atrophic alterations are most pronounced in those cells at greatest distance from the vessels.

In consequence of the interstitial proliferation, and especially of that in the immediate vicinity of the vessels, this newly formed connective tissue begins to contract as in the natural developmental stages of adult connective tissue. Interstitial sclerosis, with hardening of the organ, follows, and the lumina of the vessels thus becomes further compromised, leading to a still greater diminution in blood supply, at the same time increasing the proliferative and degenerative alterations in the walls of the vessels. Occasionally instead of atrophic and sclerotic alterations, which we may not inaptly compare to premature senility of the organs, we find instead a tendency toward the abnormal deposition of fat, so that the interstitium of the affected viscus becomes overcharged with adipose and in consequence of this an increased parenchymatous atrophy follows. These changes are particularly common in overnutrition and alcoholism.

SYMPTOMS. The symptoms which result from these alterations are: first, depressed function, manifested, for example, in the heart by deficient or irregular muscular contraction; in the pancreas by insufficient production of its digestive ferment; in the brain by faulty action of the nerve cells or delayed transmission of the nerve impulses. We must never forget, however, that by no means all portions of any organ are equally affected. This is perhaps best illustrated in the arteriosclerotic brain, where we may find certain areas that functionate normally. Nothing is more common, as all neurologists know, than to find in some arteriosclerotic patients, for example, that the higher psychical centres remain intact while serious disorders of the motor areas characterize the case, or vice versa.

Pain is a more or less constant symptom of visceral arteriosclerosis. The familiar darting or burning agony of angina pectoris is unquestionably the most familiar example of this symptom. In the earlier stages of the disease it is recognized by a sense of oppression, weight, or pressure in the affected region. This pain is present, however, in sufficient degree to be of diagnostic aid in only a very small number of cases of even extensive coronary disease, a fact well shown by my statistics. It is, however, entirely a mistake to locate this arterial pain in the heart only. Pain of the same character, and of but little less severity, also appears in other viscera similarly diseased. Thus in erythromelalgia and Reynaud's disease, when the vessels contract down, the pain simulates very closely in character and severity that of stenocardia, so much so that a clever clinician of this Academy has already half humorously, and yet with shrewd perception, spoken of " angina pectoris of the foot." A case recently in my service at the City Hospital presented, from time to time, severe attacks of abdominal pain of this particular distressing character, associated with high blood pressure, shock of greater or less degree, and exquisite tenderness in the pancreatic region. He also suffered at times from typical angina pectoris. He assured me that in either attack the pain was of the same character and of about the same intensity, differing only in location. The patient remained under my observation for some months, finally dying with an acute pneumonic infection. At the autopsy extreme pancreatic and coronary arteriosclerosis was found.

Space does not permit me to consider this symptom further at this time, but I do not wish to leave it without calling your especial attention to its importance in the study of your arterial cases. But a few weeks ago a prominent gynecologist called my attention to a very similar pain associated with certain types of chronic metritis and subinvolution, where arteriosclerotic disease of the uterus appears to be largely causative.

It has been long recognized that the arteriosclerotic kidney is responsible in a large percentage of cases for a considerable elevation in blood pressure. It has also been noted that this rise in blood pressure is not constant, but intermittent and spasmodic in the developing stages of the disease, depending on conditions of arterial spasm. Since the popular introduction of the sphygmomanometer has made the accurate determination of the blood pressure a matter of easy routine in the observation of cardiovascular and renal diseases, it will be noted by the careful observer that marked variations in blood pressure occur independent of renal disease. In a considerable number of cases I believe that I have been able to show a definite relationship between this sign and vascular disease of organs other than the kidney, particularly in arteriosclerosis of the brain, pancreas, and liver, also probably of the spleen. As yet sufficient postmortem evidence has not been collected in conjunction with these clinical observations to render them of more than probable or presumptive value, but personally I am now convinced that this marked elevation of the blood pressure is definitely connected with arterial spasm, and it certainly may affect organs other than the kidney. It is noteworthy that in general arteriosclerosis without marked disease of the splanchnic vessels, as Janeway has shown, increase of blood pressure is not the rule.

DIAGNOSIS. It is largely in the hope that more accurate methods of diagnosis may be discovered for the detection of arterial disease of the viscera that this study has been undertaken, of which I have the honor of presenting the preliminary statistical basis this evening. As yet it does not seem possible to more than establish probability in a certain number of cases. Unfortunately most clinicians depend for diagnosis too much on the condition of the peripheral arteries, which I think I have shown to be diseased in only a relatively small number of cases in which visceral arterial disease, even of pronounced and serious degree, exists. This idea must be entirely abandoned. In all probability disease of the peripheral superficial trunks succeeds in the majority of cases, if it occur at all, marked disease of the arteries of the important internal organs.

A certain, though limited, field of diagnosis in cerebral arterial disease is provided in some cases by ophthalmoscopic examination of the retina.

The presence of diminished visceral function with occasional and otherwise unaccountable elevations of the blood pressure should, particularly in connection with possible etiological factors, lead to a suspicion of some localized, if not general, area of arterial disease. When associated with pain of the peculiar anginal character, location in some special organ may be within the range of possibility. I feel quite certain that careful observation of cases of obscure abdominal pain, paroxysmal in character, and associated with elevation of the blood pressure, when sufficiently backed by united clinical and necropsical evidence, will eventually make it possible to diagnose these generally unrecognized types of arterial disease while in a stage when something may still be done for their alleviation or for the prevention of their further progress. At present, diagnosis by our usual methods becomes possible only when the time of prevention or successful treatment is usually past.

STUDIES IN TROPICAL MEDICINE.[1]

By F. Creighton Wellman, M.D.,
BENGUELLA, PORTUGUESE WEST AFRICA.

THE CHIGGER IN SOUTHWEST AFRICA.

INTRODUCTION.

The chigger, chigoe, or sand flea (to mention but a few of its common names) receives, as a rule, but slight attention at the hands of writers on tropical diseases, and is often dismissed with little more than a passing mention. The animal, however, merits more consideration than it generally receives, as it not seldom plays no insignificant role in the production of mutilation and disease. The insect is a common pest throughout the colony of Angola and is especially abundant in the district of Bailundo, where the writer is stationed. It is believed that a few notes concerning its occurrence in this part of the world may not be without interest.

NAMES AND SYNONYMS.

Pulex penetrans, Linné; *Sarcopsylla penetrans*, Westwood; *Rhynchoprion penetrans*, Oken; *Dermatophilus penetrans*, Guérin; Chigger, Jigger, Chigoe, Chego, Chigue, Chique, Tschike, Djiga (Congo), Sikke (Guiana), Bicho, Tunga, Jutecuba, Migor (Brazil),

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[1] Published under the imprimatur of the American Society of Tropical Medicine.